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BULLETIN OF THE
U.S. DEPARTMENT OF AGRICULTURE

No. 58

Contribution from the Bureau of Biological Survey, Henry W. Henshaw, Chief.
February 7, 1914.

FIVE IMPORTANT WILD-DUCK FOODS.

By W. L. McAtee, *Assistant Biologist.*

Numerous requests for Circular No. 81, containing information on the value, appearance, distribution, and propagation of three important wild-duck foods, namely, wild rice, wild celery, and pondweeds, attest the widespread demand for knowledge about plants attractive to wild fowl. The data gathered by the Biological Survey relating to duck-food plants has been widely used by State game commissions, game protective associations, and individuals interested in the protection, preservation, and propagation of our native species of ducks and geese. To make available further information of this nature the present account has been prepared, which treats of five other plants of great intrinsic value. Though at present of local importance, all of them are suitable for propagation over most of the United States, and there is no reason why they should not be introduced and take rank among the staple foods of wild ducks in many localities where now unknown.

DELTA DUCK POTATO.

VALUE AS DUCK FOOD.

In the latter part of January and early February, 1910, the writer, under authorization of the Biological Survey, visited the Mississippi Delta, La. One of the principal objects of this trip was to find out what it is that attracts large numbers of canvasbacks to this shoal-water region, the shallow ponds and lakes of which are so different from the comparatively deep water bodies frequented by canvasbacks in the northern States. The attraction was found to be a species of Sagittaria (*S. platyphylla*), which is known to the hunters of this and other parts of Louisiana as wild potato or wild onion. From an examination of a large number of stomachs it was found that about 70 per cent of the food of the canvasbacks collected consisted of the tubers of this plant, as did also more than 65 per cent of the food of the mallards. The pintail also was found to feed upon the tubers. The gullet of one canvasback was filled to the throat with the duck potatoes, 24 entire ones being present, besides ground-up remains of several others. Other individuals had 14 to 17 of the tubers in their gullets. There is no doubt that *Sagittaria platyphylla* is an impor-

tant food for the larger species of ducks not only in the Mississippi Delta but throughout the whole range of the plant.

DESCRIPTION OF PLANT.

The Delta duck potato (fig. 1) when well developed stands about 18 inches above the soil. The broadly elliptical leaves have a char-

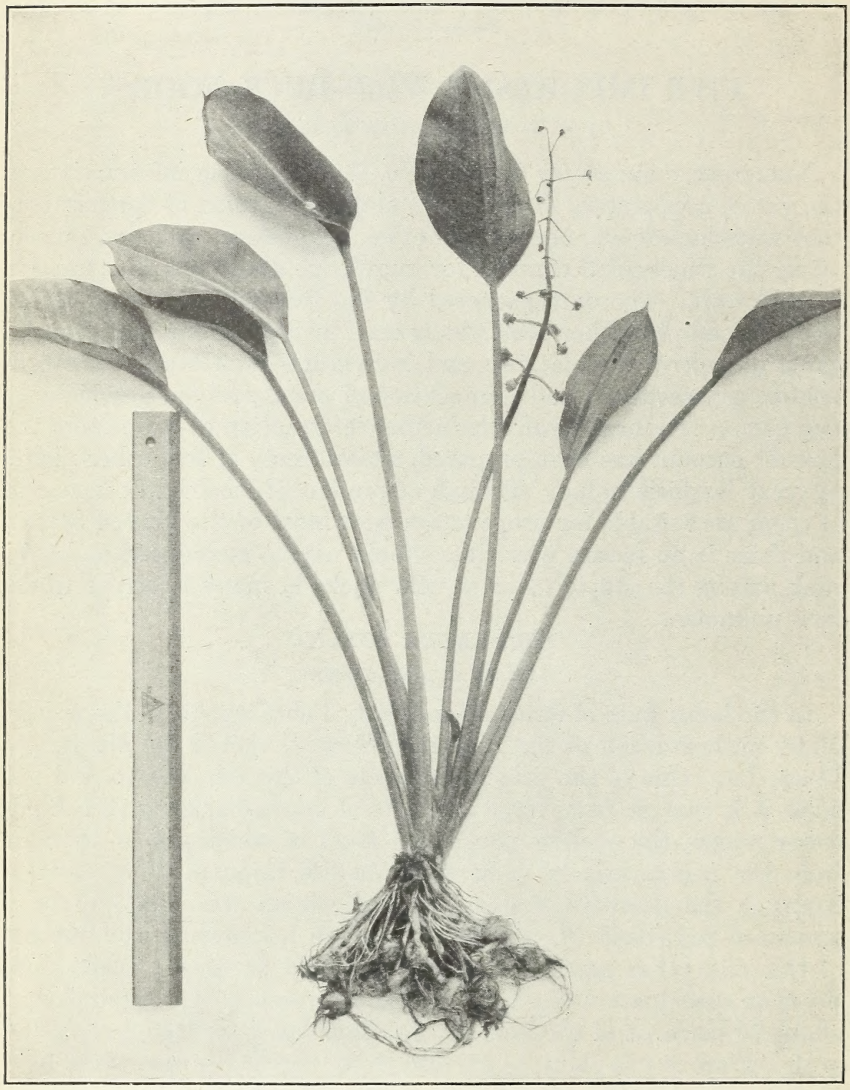

FIG. 1.—Delta duck potato. (Scale is 18 inches long.)

acteristic firm appearance and a beautiful clear green color. Like all plants of its genus, this species produces the flowering peduncles from about the center of the group of leafstalks; these peduncles bear

flowers in whorls of three, and the individual flowers each have three white petals and a yellow center. The petals soon fall and the small green balls of immature seeds remain. These enlarge during the summer, and when ripe are brown and nearly half an inch in diameter. They are easily crushed, separating into hundreds of thin triangular seeds.

The tubers are of irregular globular shape and vary up to an inch in diameter. They are formed at the ends of runners (thicker than the roots) and bear on the side opposite the attachment to the runner a scale-sheathed bud which may be an inch or more in length. Running around the body of the tuber are two or three darker lines from which originate fibrous sheaths. A glance at the illustration of the tubers (fig. 2) of this species shows the aptness of the name wild potato. It should be explained, however, that normally the tubers would be more widely separated than is the case with those on this particular specimen, which was grown in a flower pot.

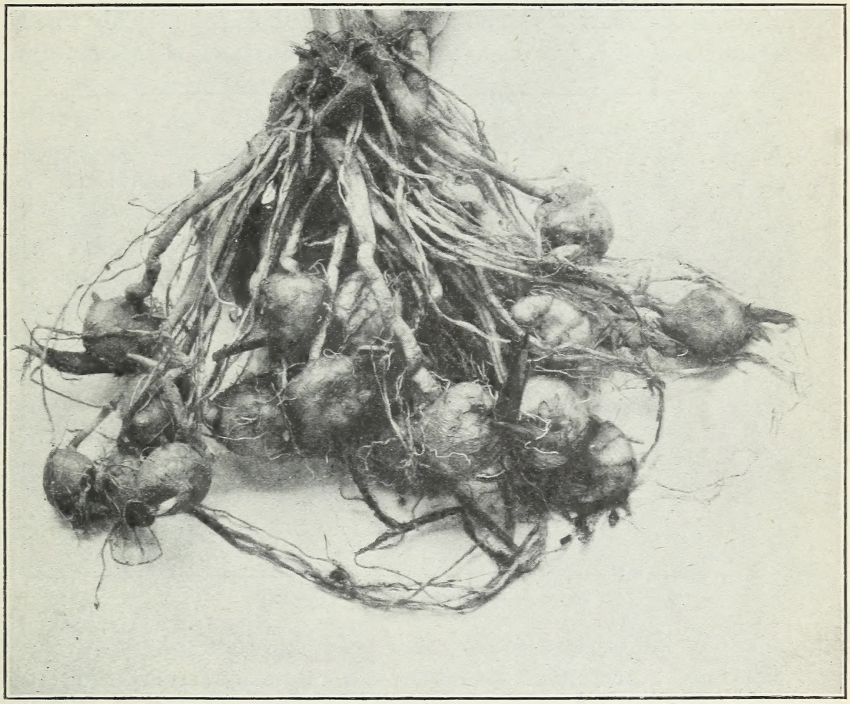

FIG. 2.—Tubers of the delta duck potato. (About two-thirds natural size.)

DISTRIBUTION.

In ancient times the Mississippi River emptied into a vast bay which extended at least as far north as the region now known as

southern Illinois. Its actively growing delta (which is still apparently in full vigor) made thick deposits of silt over some thousands of square miles of this area while the remainder was being slowly elevated. *Sagittaria platyphylla* is so nearly confined in its distribution to this ancient basin, and is so characteristic of the present delta, that the name delta duck potato is eminently fitting. The outlying points of the range of the plant as now known are San Antonio, Tex., Lake City, Mo., Chattanooga, Tenn., and Mobile, Ala. (See fig. 3.)

PROPAGATION.

The delta duck potato undoubtedly can be propagated from seed, but all things considered, transplanting the tubers is probably much the better method. This insures a large percentage of success, the

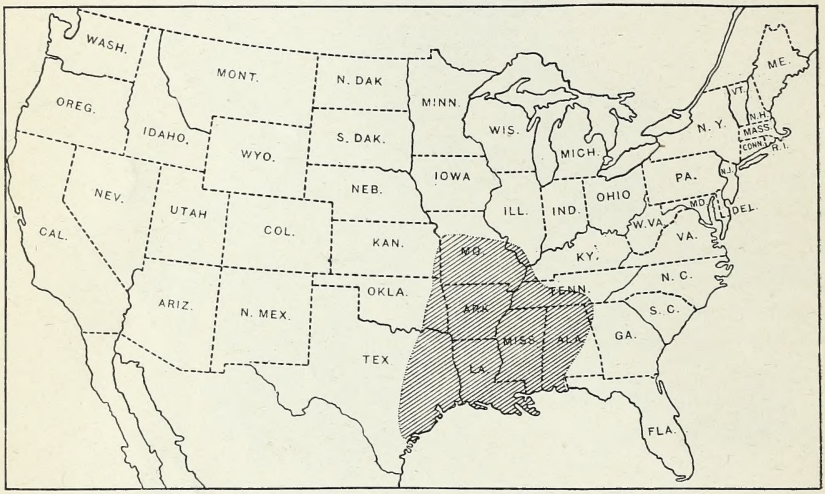

FIG. 3.—Range of the delta duck potato.

plants will be larger, and as they will produce other tubers the first year they are much more valuable. Extraordinary precautions to prevent drying are not necessary, but the tubers should be kept cool and well exposed to the air to prevent heating or fermentation.

To plant, embed the tubers in mud bottom where the water is not more than a foot deep, preferably not more than 6 inches. It is better to err on the shallow side. The plant will grow thriftily on soil never covered by water but which has plenty of moisture. In such situations, however, the tubers are not available to ducks unless overflowed in winter. The delta duck potato is not injured by a slight amount of salt in the soil. The plant is probably hardy anywhere in the southern half of the United States and may prove to be so farther north.

WAPATO.

VALUE AS DUCK FOOD.

The tubers of wapato (*Sagittaria latifolia* and *Sagittaria arifolia*) have been known to white men as an important food for wild fowl since the time of the Lewis and Clark expedition of 1804–1806. These famous explorers state that in the Columbia River Valley large numbers of ducks, geese, and swans occur where this plant is abundant and that the swans in particular feed extensively upon the plant. A correspondent of the Survey, George W. Russell, of Gaston, Oreg., writes that the wapato is fed upon most by the diving ducks, as the canvasback, redhead, and bluebills (scaups), and that they seek it whenever they are present in the country where it grows. Prof. David Dale Owen in his report of a geological survey of Wisconsin, Iowa, and Minnesota notes that these tubers afford much nourishment to the larger aquatic fowls. The vernacular names swan potato and duck potato that have been applied to these plants give further evidence of their value to wild fowl. Other local names are swamp potato, muskrat potato, Chinese onion, and water nut. The Biological Survey has found various parts of Sagittaria plants in stomachs of the following species of waterfowl: Mallard, widgeon, green-winged teal, blue-winged teal, spoonbill, pintail, canvasback, little bluebill, ruddy duck, Canada goose, and whooping swan.

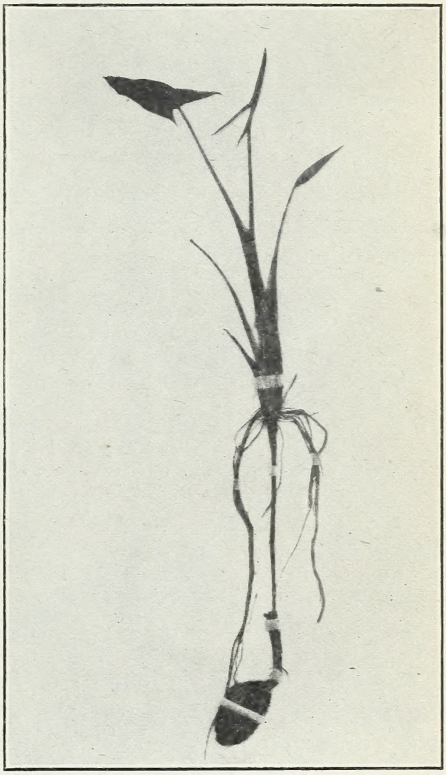

FIG. 4.—Young eastern plant of the wapato with single tuber. (Two-thirds natural size.)

DESCRIPTION OF PLANT.

The general relations of the stems, flowers, and tubers are the same in the wapato (fig. 4) as in the delta duck potato. The shape of the leaves, however, is entirely different. Both *S. latifolia* and *S. arifolia* have arrowhead-shaped leaves. These vary greatly in the length, width, and shape of the point and barbs and in the degree of

divergence of the latter. Various forms of leaves are illustrated by figure 5. The wapato plant sometimes reaches a height of 4 feet. The appearance of the flowers and seed balls is much the same as in the delta duck potato.

The tubers of *S. latifolia* (fig. 6), from six to nine in number per plant, are formed on runners in the same manner as those of the delta duck potato, but they attain a much larger size. The largest specimen examined by the writer is 2 inches in its longest diameter and 1 inch thick. Including the bud and a short stalk at the base, the entire tuber may measure as much as 5 inches in length. The mature tubers of plants from the northwest are more or less flattened, the shape being comparable to that of the ordinary edible crab. The smaller tubers are more nearly spherical (varying to ovoid), and this is the shape of even the largest tubers of eastern plants that the writer has seen. The sheaths of the tuber being of a darker color than the body are conspicuous.

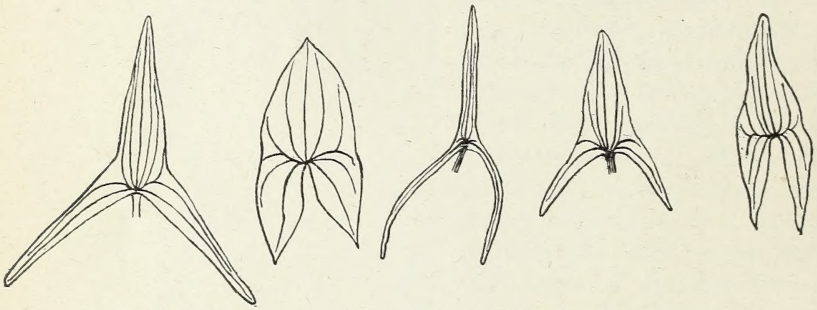

FIG. 5.—Various shapes of wapato leaves. (About one-tenth natural size.)

DISTRIBUTION.

Sagittaria latifolia is found from the Altantic to the Pacific coast, its range covering practically the whole United States. Areas from which it apparently has not been reported are peninsular Florida, the southern two-thirds of Louisiana and Texas, New Mexico, Arizona, and southern California. The northern limit of its range is marked by the following localities: Vancouver Island, Saskatchewan River, and southern Ontario and Quebec. *Sagittaria arifolia* is confined to States from Michigan and Kansas westward. Its range is largely included in that of *latifolia*, although it has been collected in New Mexico. The two species are only distinguishable with certainty upon the basis of mature seeds, and for all practical purposes may be considered as one. (See fig. 7.)

PROPAGATION.

Wapato may be transplanted by means of both seeds and tubers, but the latter are the most reliable and give the quickest results. They may be set with the bud just beneath the surface in mud bottom under a foot, or preferably less, of water. The plants will grow in

wet soil, but the tubers are not available for duck food in such places unless overflowed in fall and winter.

The tubers of this plant are known to retain their vitality when dried, but more uniform success will probably be had if drying is not

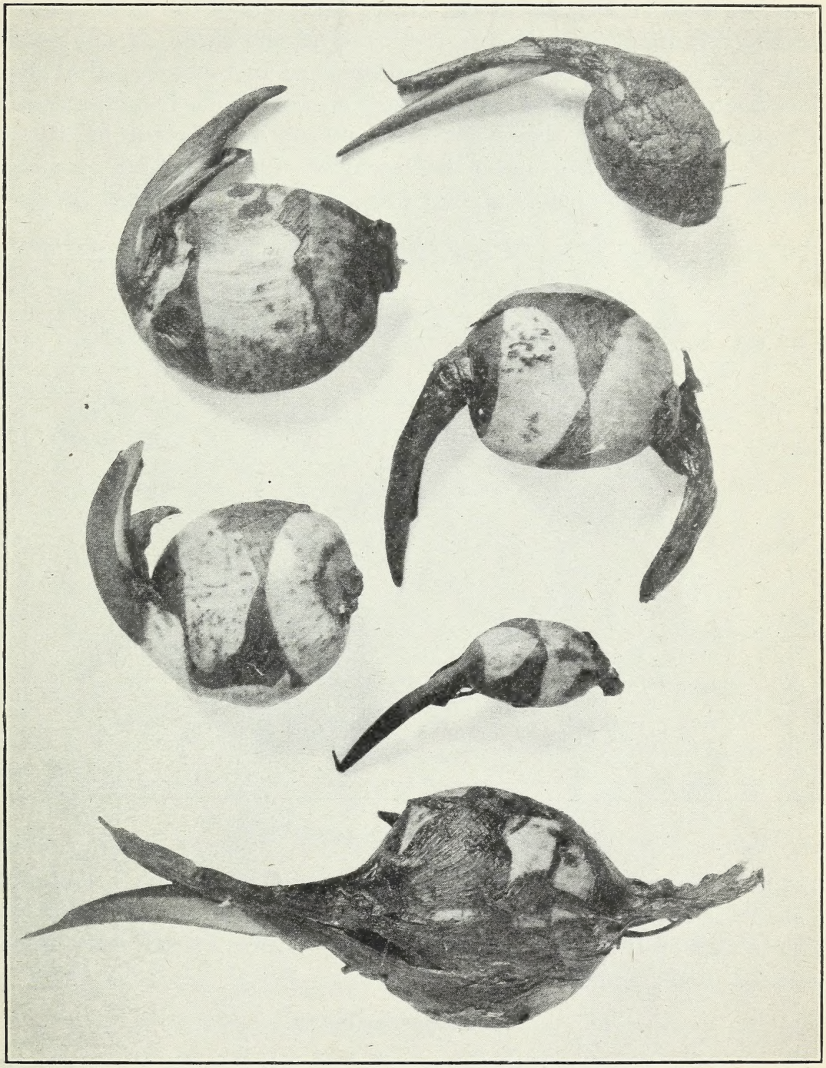

FIG. 6.—Wapato tubers. (About two-thirds natural size.)

carried to an extreme. We recommend that the tubers be shipped promptly after gathering, in well ventilated packages, and that they be planted immediately upon receipt. Wapato is suitable for cultivation in practically all parts of the United States.

CHUFA.

VALUE AS DUCK FOOD.

Like some of the other duck foods mentioned in this circular, chufas are at present known to be of only local importance. Those best acquainted with conditions at Big Lake, Ark., one of the most famous hunting grounds of the South, believe that the chufa, or nut grass, as it is there called, is the principal element in rendering that lake so attractive to waterfowl. Examination of stomachs from that locality seems to justify this belief. Six out of a series of nine mallards collected at Big Lake in December, 1910, had fed on sedge tubers, the average percentage of which in the total food of the nine

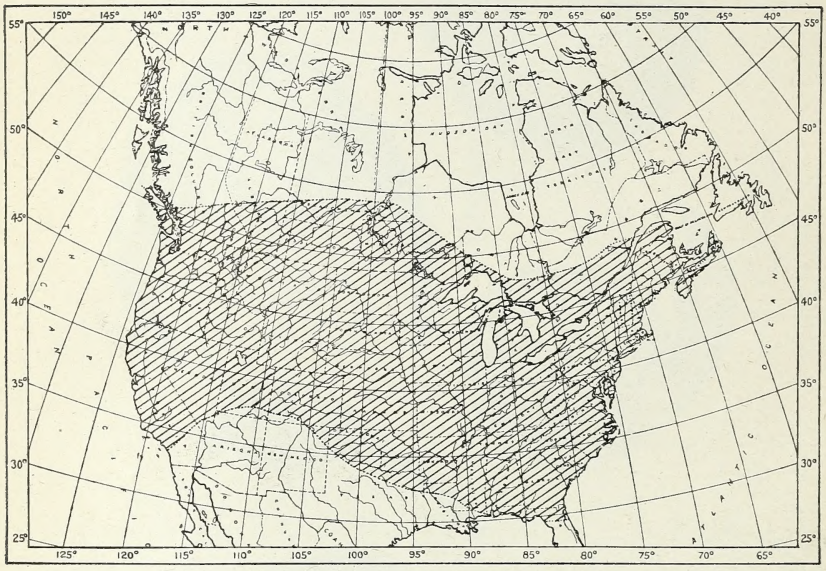

FIG. 7.—Range of the wapato.

was 56. Tubers of this species or others of its genus have been found also in duck stomachs from Florida, Illinois, Minnesota, and California. The species of ducks now known to feed on chufas are the wood duck, mottled duck, mallard, and canvasback.

DESCRIPTION OF PLANT.

The chufa (*Cyperus esculentus*) (fig. 8) belongs to the group of plants known as sedges. These are grass-like and usually classed with the grasses by nonbotanists. Many of the sedges, however, including the chufa, have triangular, not round, stalks. The members of the genus *Cyperus* have a group of leaves at the base from which rises the stalk bearing the flowers and seeds. In the chufa these stalks are from 1 to 3 feet high. Several flower clusters on peduncles of

varying length rise from the top of the stalk. From the same point three rather long grass-like leaves project below the fruiting clusters.

Many members of the genus have a very similar appearance and it is not expected that nonbotanical observers can distinguish them. This is unnecessary, however, as tubers of the chufa for

FIG. 8.—Seed-bearing and immature plants of the chufa. (Much reduced.)

propagation may be obtained from most seedsmen. The tubers of the chufa are formed at the ends of scale-covered rootstocks. The plant is extremely prolific, cultivated forms usually producing 100 tubers to the plant, and instances are known in which more than 600 tubers were produced in one season from one tuber planted in the spring.

Well-developed tubers of the cultivated variety average about three-fourths of an inch in length by three-eighths of an inch in diameter when dried. Tubers from wild plants are usually much smaller and have a greater proportion of fiber. The general appearance of chufas and of tubers from a wild sedge are well shown by figure 9.

Chufas are known also by the vernacular names, earth almonds and ground nuts, and the plant as nut grass and cache-cache.

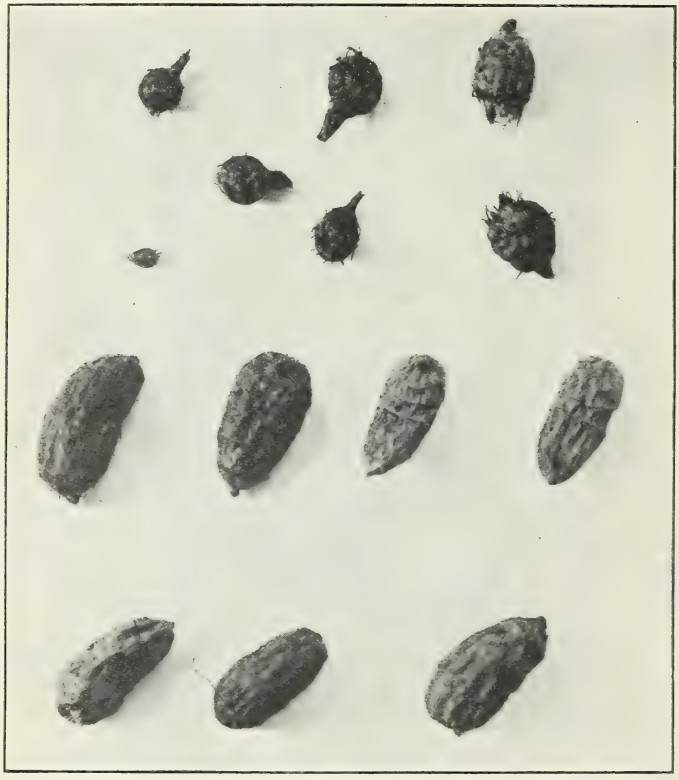

FIG. 9.—Tubers of wild *Cyperus* and cultivated chufas. (Natural size.)

DISTRIBUTION.

The northern boundary of the natural range of the chufa is marked by the following localities: Southern New Brunswick, southern Ontario, northern Nebraska, New Mexico, Arizona, and the Columbia River Valley. The plant seems to be absent from most of the Great Basin and Rocky Mountain regions. From the northern line specified the plant ranges southward over the remainder of the continent. (See fig. 10.) It is widely distributed in warm climates over the entire world.

PROPAGATION.

Although the chufa seems not to grow naturally in a large area in the western United States, there is no doubt that it can be cultivated everywhere except in the higher parts of the Rocky Mountain region. It is said to do fairly well at the altitude of Denver.

Chufas can be obtained from most seedsmen and are so cheap that it will pay sportsmen to buy new stock every few years, if earlier plantings show degeneration in size of the tubers and hence reduction in value as duck food. Chufas do best on light or somewhat sandy but rich soils. They are only available for duck food when planted

FIG. 10.—Range of the chufa.

on land dry in summer and overflowed in winter. In the open they should be planted thickly so as to give the plants a better chance in competition with weeds. In timbered land they need not be planted so thickly, but they will do well only in rather sparse growths, where considerable light penetrates to the ground. When possible the land where planting is intended should be broken up and freed from weeds. Plant the tubers just beneath the surface in spring.

WILD MILLET.

VALUE AS DUCK FOOD.

Wild millet (*Echinochloa crus-galli*) is an important food for ducks in widely separated regions of the United States. At Mud Lake,

Ark., the writer found seeds of this plant to constitute more than 10 per cent of the food of the 41 mallards collected; at Belle Isle, La., it made up more than half of the food of the few mallards examined, and at Cameron, La., over 75 per cent of the diet of a collection of 50 ducks of the same species. Pintails, teal, and other shoal-water ducks are almost equally fond of it. Geese eat the stems and leaves of the plant, as also do ducks when they are hard pressed. Testimony as to the value of the plant has come from Wisconsin and Oregon, and the Biological Survey has found seeds of wild millet in duck stomachs from Massachusetts, South Dakota, Missouri, and Nebraska in addition to the States above mentioned.

The plant is popularly known throughout lower Louisiana as wild rice and is given about the same rank as a duck food as the plant (*Zizania aquatica*) known by that name in the north. Other popular names referring to the preference of wild fowl for the plant are goose grass and blue duck food.

DESCRIPTION OF PLANT.

Wild millet is a coarse, leafy grass which grows from 1 to 6 feet in height. The stems and foliage are not especially remarkable, but the fruiting head has characters which enable us easily to distinguish this from other species of native grasses. The chaff or outer seed coverings is set with rows of short, stiff, outstanding spines. These project beyond the general outline of the body of the seeds and give them an easily visible spiny appearance (fig. 11). The inner scale of the chaff terminates in a spine which is always stouter and longer than the others. This spine or awn may be very short or it may be from 2 to 3 inches long or more, surpassing by many times the length of the seed. One of the other scales also may bear a long spine at the tip. The prickly character of the seed coverings is referred to in the name cockspur grass. The longer awns in particular and sometimes the whole fruiting heads may have a deep purplish color. This, no doubt, suggested the name blue duck food used in the Mississippi Delta. The long-awned form has been given the varietal name *longearistata* but for present purposes we may consider all the types illustrated in figures 11 and 12 under the same name. It is probable also that the form named *Echinochloa walteri* is fully connected with *crus-galli* by intergrades, and deserves only varietal rank. This form has the lower or all leaf sheaths rough hispid.

DISTRIBUTION.

The northern limit of the range of wild millet so far as known to us does not much surpass the latitude of the northern boundary of the United States. From there the plant ranges indefinitely to the southward, occurring generally in rich moist soils or swamps at least to Central America.

FIG. 11.—Part of fruiting head of wild millet. (Natural size.)

PROPAGATION.

Wild millet is easily cultivated and reseeds itself. It requires a moist and preferably a rich soil, such as the edge of a marsh or lake, and it will grow in water at least a foot in depth. Break up the soil (mainly for the purpose of discouraging other plant growth) and sow thickly in spring. Once established, the plant will take care of itself. The nearer to water it is planted the more available it will be for duck food. It is a splendid plant to use for low lands that are flooded in winter.

The seeds are sold by most seedsmen under the name barnyard grass. A variety has been widely advertised as Japanese barnyard

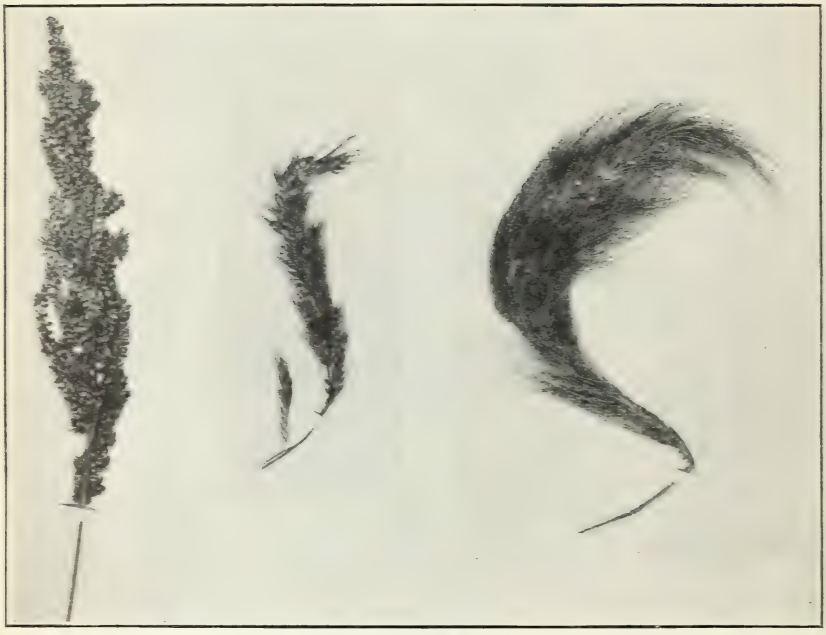

FIG. 12.—Fruiting heads of wild millet. (One-third natural size.)

millet or billion-dollar grass. The plant is also known as cockspur grass and sour grass. It may be cultivated in any part of the United States having the proper soil conditions.

BANANA WATER LILY.

VALUE AS DUCK FOOD.

The writer has investigated the value of the banana water lily (*Nymphæa mexicana*) as a food for wild ducks in only one locality—Lake Surprise, Tex. The proofs of its importance are so great, however, that they should be brought to the attention of American sportsmen. At Lake Surprise the banana water lily alone made up

nearly half of the entire food of the 10 vegetarian species of ducks occurring there at the time. This showing is much more significant from the fact that sago pond weed (*Potamogeton pectinatus*) also was abundant in the lake. The latter plant, in the writer's opinion, is the best all-round duck food [1] in North America, yet at Lake Surprise it furnished somewhat less than 29 per cent of the food of the ducks in comparison with more than 48 per cent supplied by *Nymphæa mexicana*.

Thirty-seven canvasbacks collected at Lake Surprise had eaten various parts of this plant to the extent of 71.6 per cent of their diet. This is a second illustration of the unusual phenomenon of the canvasback's being attracted to shallow water by a highly prized food. Six ring-necked ducks or blackjacks made more than 91 per cent of their food of this plant, and two southern black ducks (*Anas fulvigula*) 98 per cent. The parts eaten are the rootstocks, stolons, tubers, and seeds. Mr. Charles W. Ward has sent us rootstocks of *Nymphæa mexicana* from Avery Island, La., with the information that this plant and wild celery (*Vallisneria spiralis*) furnish the bulk of the food of canvasbacks in that locality.

DESCRIPTION OF PLANT.

For the purposes of field identification the water lilies of the United States may be divided primarily into two groups according to the shape of the leaf. Two genera, the water shield (*Brasenia*)[2] and the American lotus, or water chinkapin (*Nelumbo*),[2] have entire circular leaves with the leaf stalks attached at their centers. The remaining two genera have more or less heart-shaped leaves or a circular or oval leaf with a cleft or sinus from the edge to the point of attachment of the leaf stalk. Of these two genera, one (*Nuphar*),[2] including the spatterdocks or toad lilies, has the top or more of the ovary plainly visible when in flower, the other has the ovary practically hidden by the very numerous stamens. To this last group belongs *Nymphæa mexicana*, and it is the only native species of the genus that has yellow flowers.

Both the leaves and flowers of this species may either float on the surface of the water or stand a few inches above it. The leaves are green above with brown mottlings and vary from greenish to purplish red below with small black markings. The edges of the cleft of the leaf are either somewhat separated or overlapping (fig. 13). The plant springs from an upright rootstock (fig. 14) which bears some resemblance to an unopened pine cone. The rootstocks vary in size up to 2 inches in thickness and 12 inches in length. The smaller ones (at least up to $1\frac{3}{4}$ inches in length by three-fourths of an inch in thickness) are swallowed by ducks.

[1] See Biological Survey Circular 81, pp. 11–17, for full account.

[2] The seeds, at least, of all these plants are eaten by many kinds of ducks.

Tender white stolons or runners extend in various directions from the rootstock. These runners are from a quarter to half an inch in diameter. During the active growing season they give rise to new plants, but in autumn they form peculiar hibernating bodies. These consist of the short modified tip of the stolon, which bears several (1–7) upwardly-directed buds on one side and a cluster (2–17) of thick tuberlike roots on the other. The appearance of these (fig. 15) is strongly suggestive of a miniature "hand" of bananas, and for this reason the name banana water lily is proposed for this plant, which

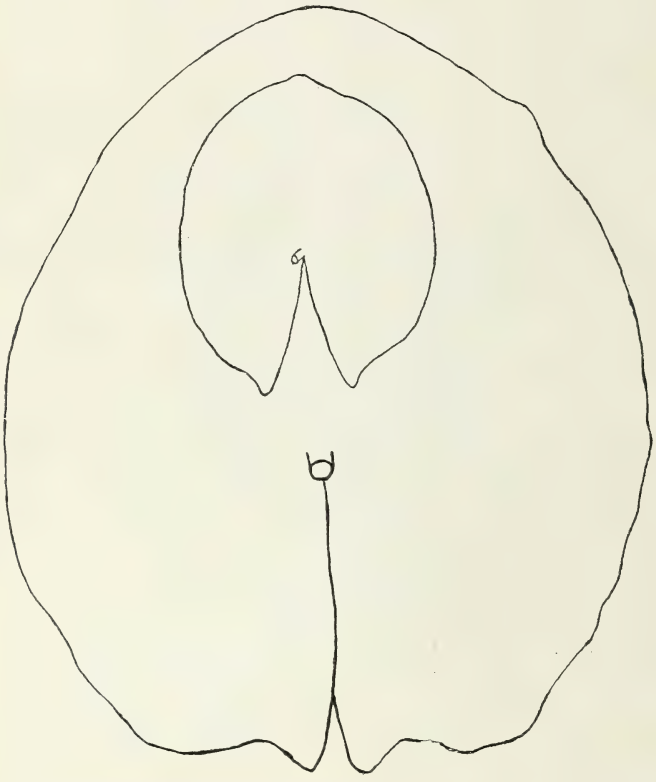

FIG. 13.—Two types of leaves of the banana water lily. (The larger outline half natural size.)

at present has no distinctive vernacular appellation. The name has the additional merit of suggesting the yellow color of the tubers and of the flowers.

DISTRIBUTION.

The banana water lily has been known chiefly as a native of Florida and the plants of that State have long gone under the name *Nymphæa flava*. Plants identified from a few localities in Mexico and from Brownsville, Tex., have been called *N. mexicana*. Dr. H. S. Conard, who has monographed the genus,[1] unites these species, as he

[1] Publication No. 4, Carnegie Institution, 1905.

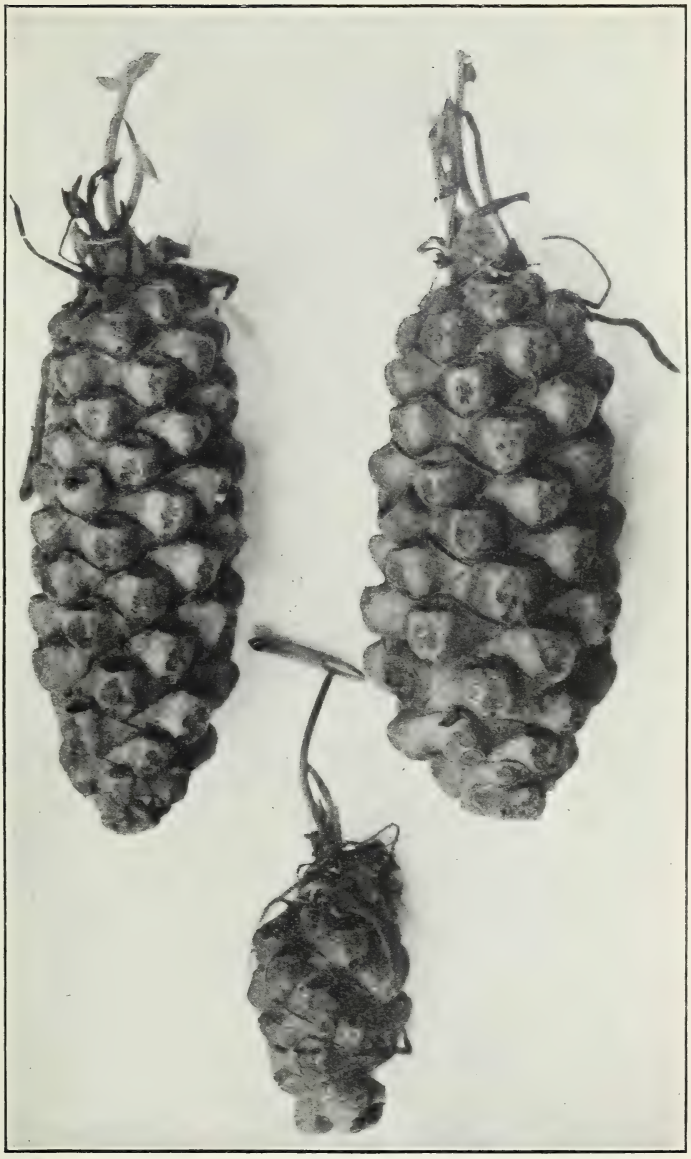

FIG. 14.—Small rootstocks of the banana water lily. (Natural size.)

is fully justified in doing on the basis of their possession in common of characters unique among water lilies. The new records of the plant from Galveston, Tex., and Avery Island, La., go far toward bridging

FIG. 15.—Hibernating bodies of the banana water lily. (Two-thirds natural size.)

the previous apparent gap in distribution of the plant and to corroborating Dr. Conard's views. The accompanying map (fig. 16) shows the probable natural range of the species.

FIG. 16.—Range of the banana water lily.

PROPAGATION.

Although the banana water lily is native to only a small portion of the United States, it can be successfully grown over practically the whole country. The plant has long been familiar in cultivation and is sold by most dealers in ornamental aquatics. The water lily expert of one of the largest firms in the United States has informed us that

Nymphæa mexicana is perfectly hardy as far north as New York City when covered with a foot of water and he believes that if covered with 2 feet of water it would be hardy at Boston.

The banana water lily needs an abundance of sunlight, water from 1 to 3 feet deep,[1] and a mud bottom. It is not injured by a trace of salt, as is shown by its growing in lakes very near the coast The rootstocks may be planted by weighting them with stones and dropping where desired. They have great vitality; they may be shipped with only moderate precautions to prevent them from drying, and may be transplanted at almost any time of the year.

[1] When established it will spread to places where the water is even 5 feet deep.

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